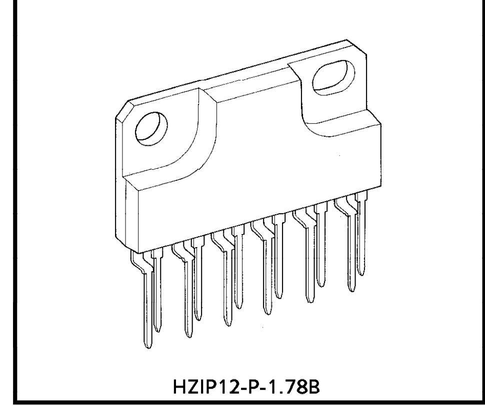
TOSHIBA BIPOLAR LINEAR INTEGRATED CIRCUIT SILICON MONOLITHIC

TA7280P, TA7281P

5.8W DUAL AUDIO POWER AMPLIFIER.

22W BTL AUDIO POWER AMPLIFIER.

The TA7280P, TA7281P are dual audio power amplifier for consumer applications.
It is designed for high power, low distortion and low noise.
It also contains various kind of protectors.
It is suitable for car-audio power amplifier with high performance.
The kinds of pin configuration are Available : Normal (TA7280P) and Reverse (TA7281P) for easier layout design of PC-board when used in BTL-stereo application.



HZIP12-P-1.78B

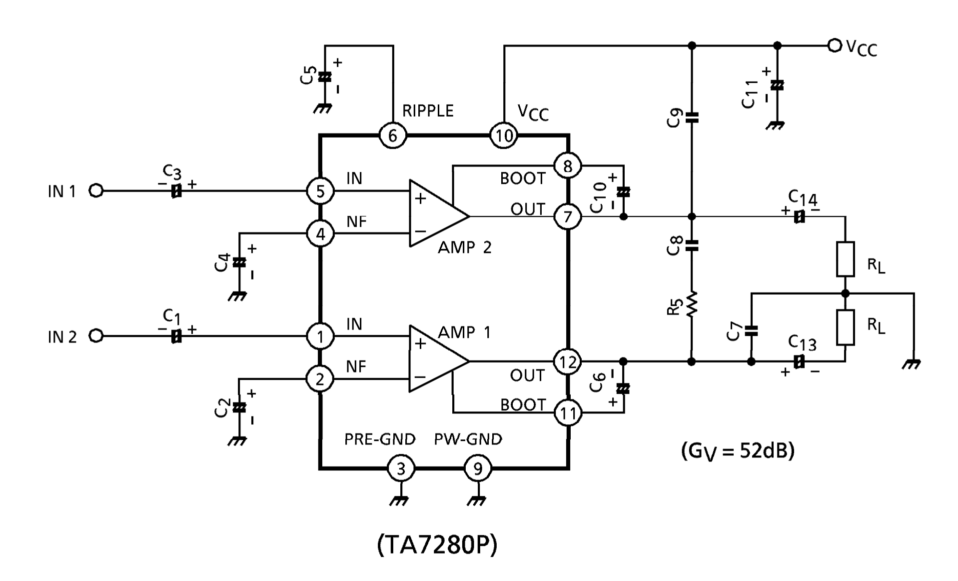
Weight : 4.04g (Typ.)

FEATURES

- High Power
  : $P_{OUT\,(1)}$ = 22W (Typ.)
  (V_{CC} = 14.4V, f = 1kHz, THD = 10%, R_L = 4Ω, BTL)
  $P_{OUT\,(2)}$ = 19W (Typ.)
  (V_{CC} = 13.2V, f = 1kHz, THD = 10%, R_L = 4Ω, BTL)
  $P_{OUT\,(3)}$ = 15W (Typ.)
  (V_{CC} = 13.2V, f = 1kHz, THD = 1%, R_L = 4Ω, BTL)
  $P_{OUT\,(4)}$ = 5.8W (Typ.) / ch
  (V_{CC} = 13.2V, f = 1kHz, THD = 10%, R_L = 4Ω, DUAL)
- Low Distortion
  : THD (1) = 0.03% (Typ.)
  (V_{CC} = 13.2V, f = 1kHz, P_{OUT} = 4W, R_L = 4Ω, G_V = 40dB, BTL)
  THD (2) = 0.06% (Typ.)
  (V_{CC} = 13.2V, f = 1kHz, P_{OUT} = 1W, R_L = 4Ω, G_V = 52dB, DUAL)
- Low Noise
  : $V_{NO\,(1)}$ = 0.14mV$_{rms}$ (Typ.)
  (V_{CC} = 13.2V, R_L = 4Ω, G_V = 40dB, Rg = 0, DIN Noise : DIN45405, BTL)
  $V_{NO\,(2)}$ = 0.7mV$_{rms}$ (Typ.)
  (V_{CC} = 13.2V, R_L = 4Ω, G_V = 52dB, Rg = 10kΩ, BW = 20Hz~20kHz, DUAL)
- Protector Circuit
  : Thermal Shout Down, Over Voltage Protection, Out-V_{CC} Short, OUT-GND Short and Out-Out Short Protection.
- Operating Supply Voltage Range
  : $V_{CC\,(opr)}$ = 9~18V

961001EBA1

BLOCK DIAGRAM
DUAL



(TA7280P)

APPLICATION INFORMATION (This explanatory terminal number is for TA7280P)

1. VOLTAGE gain adjustment

(1) DUAL amplifier

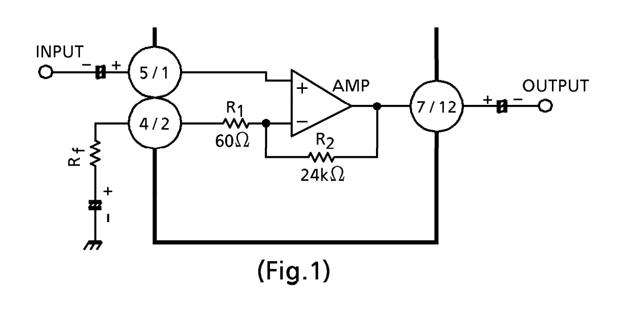
The voltage gain G_V is determined by R_1, R_2 and R_f in (Fig.1).

$$G_V = 20\ \ell og\ \frac{R_f + R_1 + R_2}{R_f + R_1}\ \text{(dB)}$$

In case of $R_f = 0$

The voltage gain is set as follows :

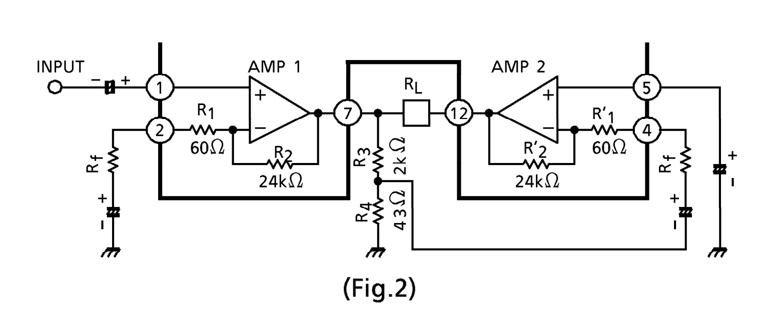
$G_V = 52\text{dB}$ (Typ.)



(Fig.1)

(2) BTL amplifier

The recommended BTL connection amplifier shown in (Fig.2).
AMP. 1 is noninverting amplifier and AMP. 2 is invert one.
The output voltage is divided by resistors R_3 and R_4.
The divided voltage is applied to inverting input of AMP. 2. R_3 and R_4 are determined in the following equation.



(Fig.2)

$$\frac{R_3 + R_4}{R_3} = 20\ell og\ \frac{R_f + R_1 + R_2}{R_f + R_1}\ \text{(dB)}$$ G_V in Dual Mode

The voltage gain in this circuit is 6dB higher than that in Dual mode.

$$G_V = 20\,\ell og \frac{R_f + R_1 + R_2}{R_f + R_1} \text{ (dB)}$$

In case of $R_f = 0$

$G_V = 52 + 6 = 58$ (dB)

In case of $R_f = 430\Omega$

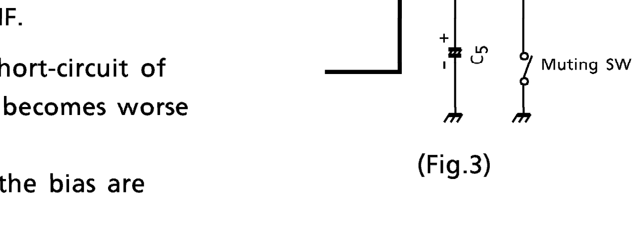
$G_V = 34 + 6 = 40$ (dB)

Each voltage gain can be set as shown above.

2. Muting

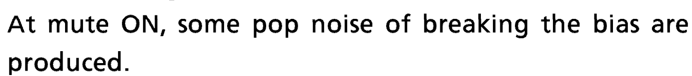
Audio muting can be accomplished by connecting pin⑥ (ripple filter) to GND as shown in (Fig.3). Then, the bias circuits are cut off.
However, caution must be exercised to the following items.

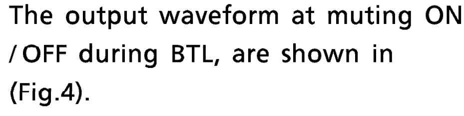
(1) The recovery time from the muting operation is determined by the capacities of the ripple filter capacitor between pin⑥ and GND, and of the capacitor for NF.

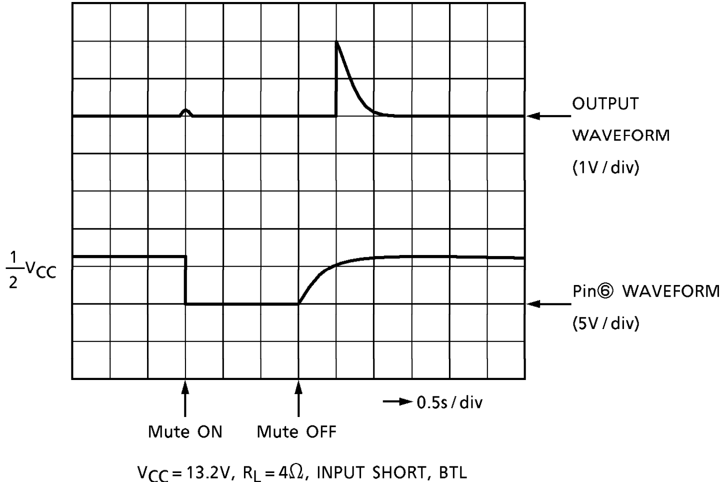


(Fig.3)

(2) As this muting system is operated by the short-circuit of ripple filter : C_5, the ripple rejection ratio becomes worse in the muting condition.


At mute ON, some pop noise of breaking the bias are produced.


The output waveform at muting ON / OFF during BTL, are shown in (Fig.4).
(Provided $V_{CC} = 13.2V$, $R_L = 4\Omega$, non-signal.)
50dB or more can be obtained for muting amount.



$V_{CC} = 13.2V$, $R_L = 4\Omega$, INPUT SHORT, BTL
(Fig.4)

3. Measures against oscillation

C_7, C_8, C_9, C_{12} : The capacitor of polyester film having small variation of the temperature characteristics is recommended as the capacitor for oscillation prevention.

C_{12} : Reduces the gain in the high range frequency (150kHz or over) and increases the oscillation allowance.

R_5 : Increases the oscillation allowance at output cripping of the low range frequency (100Hz or less).

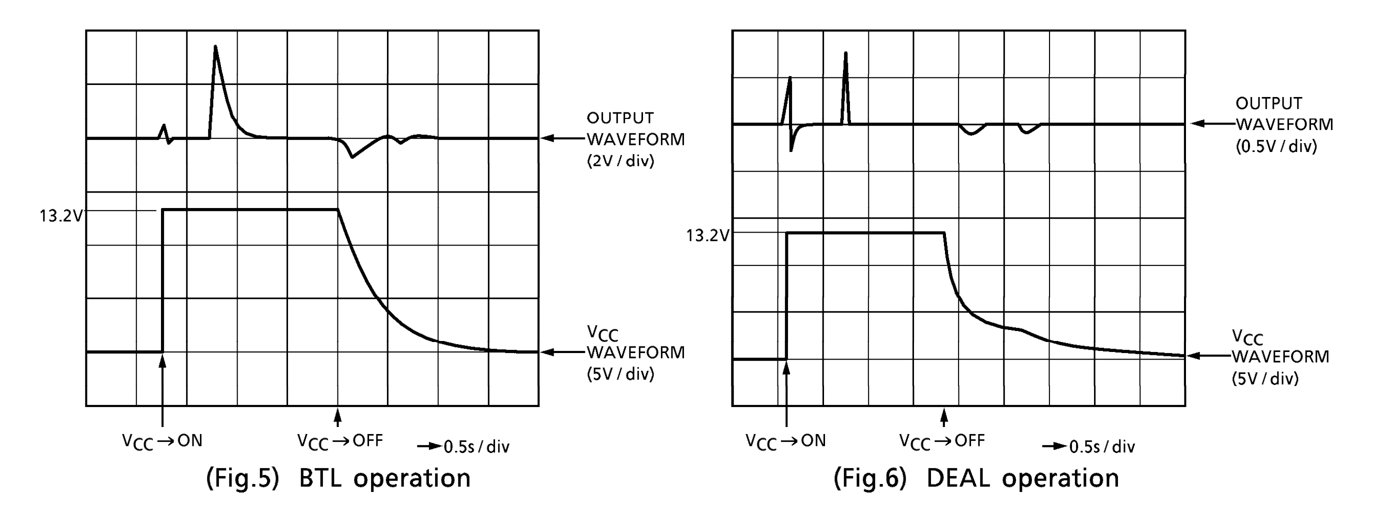
Since the oscillation allowance varies according to the following item, carry out the temperature test to confirm the oscillation allowance.

(1) Gain to be used (G_V setting).
(2) Capacity of capacitor
(3) Kinds of capacitor
(4) Layout of printed board

It is recommended to use the capacitor having the capacity exceeding the oscillation stopping value.
At using with the voltage gain G_V lowered or with the high range frequency and the oscillation becomes liable to be produced.
Therefore, application with $G_V = 40$dB or over is advisable.
Especially for using with the gain lowered in DUAL operation, insert 1000pF between NF (Pin② and Pin④) and GND.
This capacitor reduces the gain of the high range frequency and is effective for oscillation prevention.

4. Output waveform at power supply ON / OFF (Reference)

BTL and dual amplifier DC output waveforms in the condition of $V_{CC} = 13.2$V, $R_L = 4\Omega$ at non-signal (input short) are shown in (Fig.5) and (Fig.6).



(Fig.5) BTL operation (Fig.6) DEAL operation

The popping time at power supply ON / OFF varies according to the rise and fall times.
The condition in which the power supply is rapidly and repeatedly made ON / OFF, that is, the condition in which the charge is made on the external capacitor of IC is different from the conditions shown in (Fig.5) and (Fig.6).

MAXIMUM RATINGS (Ta = 25°C)

CHARACTERISTIC	SYMBOL	RATING	UNIT
Peak Supply Voltage (0.2s)	V_{CC} (surge)	45	V
DC Supply Voltage	$V_{CC\ (DC)}$	25	V
Operating Supply Voltage	$V_{CC\ (opr)}$	18	V
Output Current (Peak)	$I_{O\ (Peak)}$	4.5	A
Power Dissipation	P_D	25	W
Operating Temperature	T_{opr}	−30~85	°C
Storage Temperature	T_{stg}	−55~150	°C

ELECTRICAL CHARACTERISTICS
(Unless otherwise specified, V_{CC} = 13.2V, R_L = 4Ω, R_g = 600Ω, f = 1kHz, Ta = 25°C)

	CHARACTERISTIC	SYMBOL	TEST CIR-CUIT	TEST CONDITION	MIN.	TYP.	MAX.	UNIT
Quiescent Current		I_{CCQ}	2	V_{IN} = 0	—	80	145	mA
BLT Connection Mode	Output Power	$P_{OUT\ (1)}$	1	THD = 10%, V_{CC} = 14.4V	—	22	—	W
		$P_{OUT\ (2)}$	1	THD = 10%	16	19	—	
		$P_{OUT\ (3)}$	1	THD = 1%	12	15	—	
	Total Harmonic Distortion	THD (1)	1	P_{OUT} = 4W, G_V = 40dB	—	0.03	0.25	%
	Output Offset Voltage	V_{OFF}	1	V_{IN} = 0	—	0	0.35	V
	Voltage Gain	$G_{V\ (1)}$	1	V_{OUT} = 0.775V_{rms} (0dBm)	—	40	—	dB
	Output Noise Voltage	$V_{NO\ (1)}$	1	R_g = 0 DIN45405 noise filter	—	0.14	—	mV_{rms}
	Ripple Rejection Ratio	R.R. (1)	1	f_{ripple} = 100Hz V_{ripple} = 0.775V_{rms} (0dBm)	—	−52	−40	dB
DUAL Mod	Output Power	$P_{OUT\ (4)}$	2	THD = 10%	5	5.8	—	W
	Total Harmonic Distortion	THD (2)	2	P_{OUT} = 1W	—	0.06	0.30	%
	Voltage Gain	$G_{V\ (2)}$	2	V_{OUT} = 0.775V_{rms} (0dBm)	50	52	54	dB
	Voltage Gain Ratio	ΔG_V	2	V_{OUT} = 0.775V_{rms} (0dBm)	−1	0	1	dB
	Output Noise Voltage	$V_{NO\ (2)}$	2	R_g = 10kΩ BW = 20Hz~20kHz	—	0.7	1.5	mV_{rms}
	Ripple Rejection Ratio	R.R. (2)	2	f_{ripple} = 100Hz V_{ripple} = 0.775V_{rms} (0dBm)	—	−52	−40	dB
	Cross Talk	C.T.	2	V_{OUT} = 0.775V_{rms} (0dBm)	—	−57	—	dB
	Input Resistance	R_{IN}	2	f = 1kHz	—	33	—	kΩ

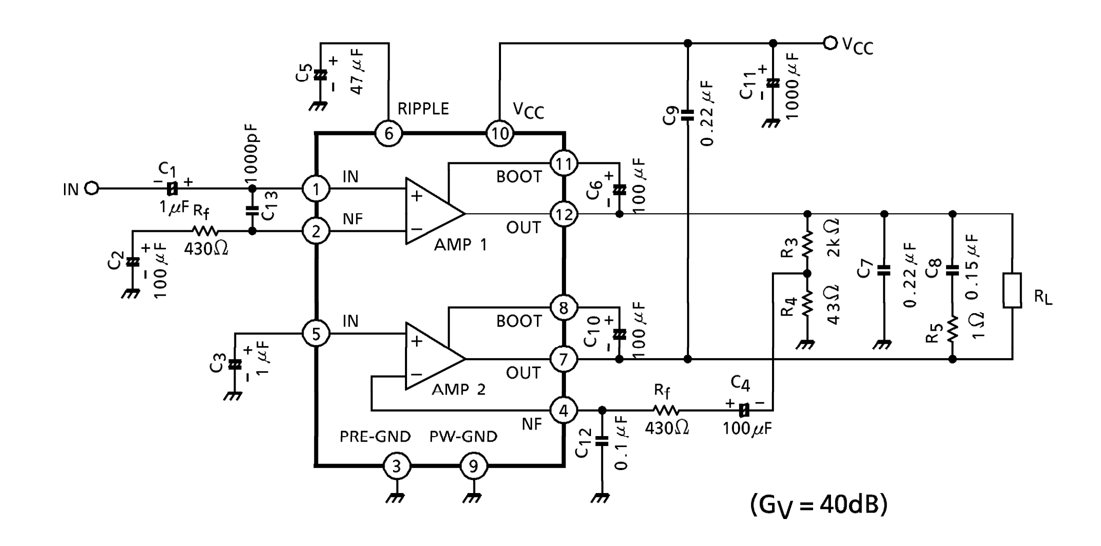
TYP. DC VOLTAGE OF EACH TERMINAL
(V_{CC} = 13.2V, Ta = 25°C, dual mode test circuit)

TERMINAL No.		1	2	3	4	5	6	7	8	9	10	11	12
DC VOLTAGE (V)	TA7280P	1.5	1.5	GND	1.5	1.5	6.4	6.4	12.3	GND	V_{CC}	12.3	6.4
	TA7281P	6.4	12.3	V_{CC}	GND	12.3	6.4	6.4	1.5	1.5	GND	1.5	1.5

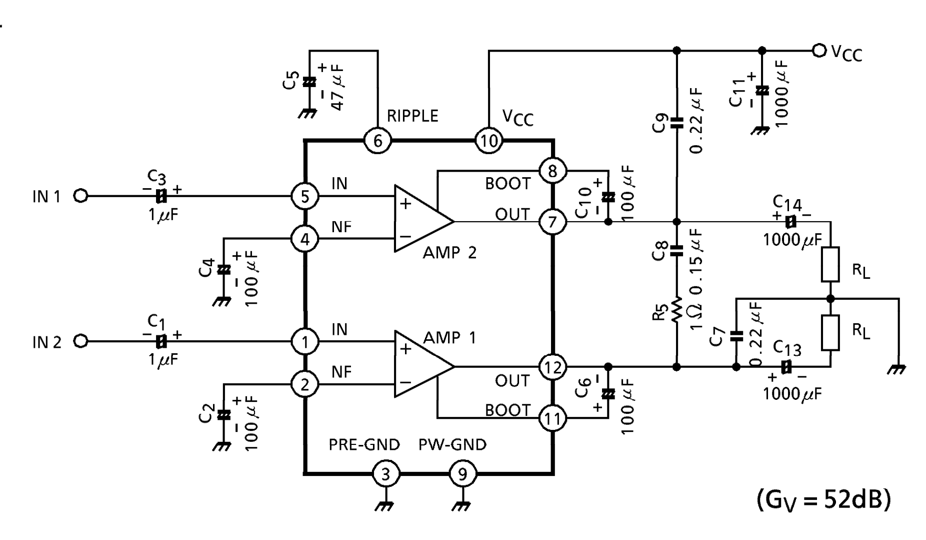
TEST CIRCUIT / APPLICATION CIRCUIT

TA7280P

(1) BTL

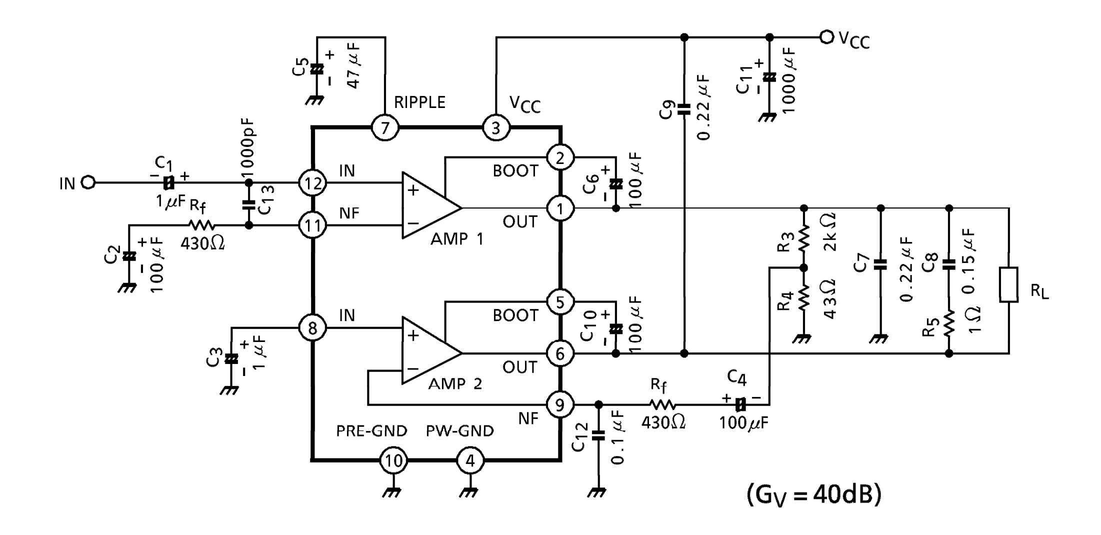


(2) DUAL

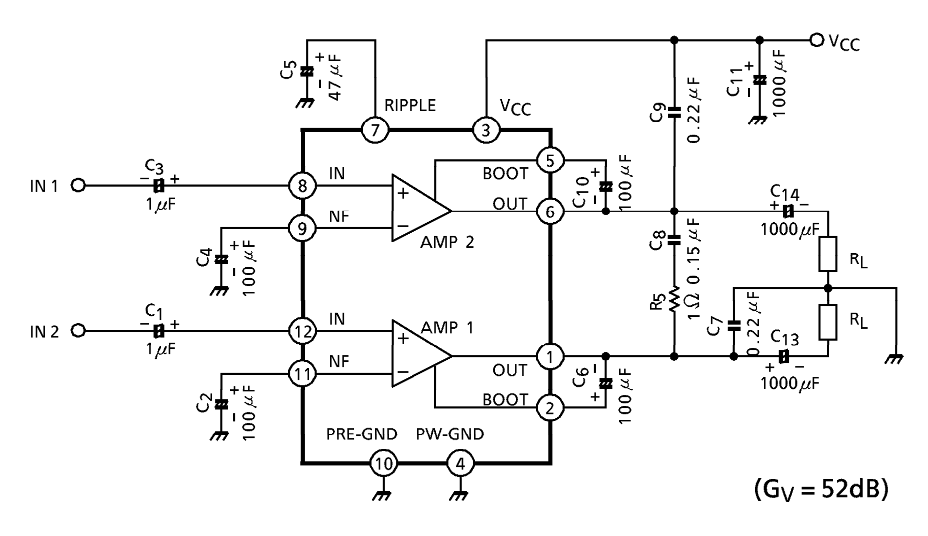


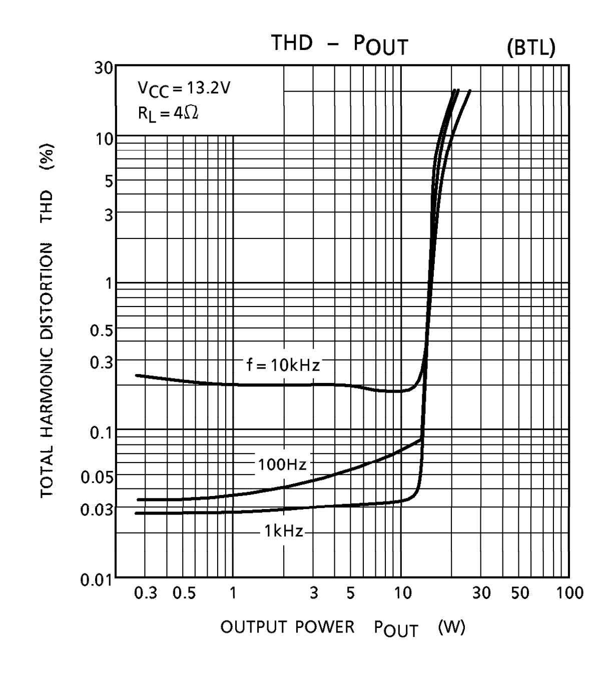
TA7281P

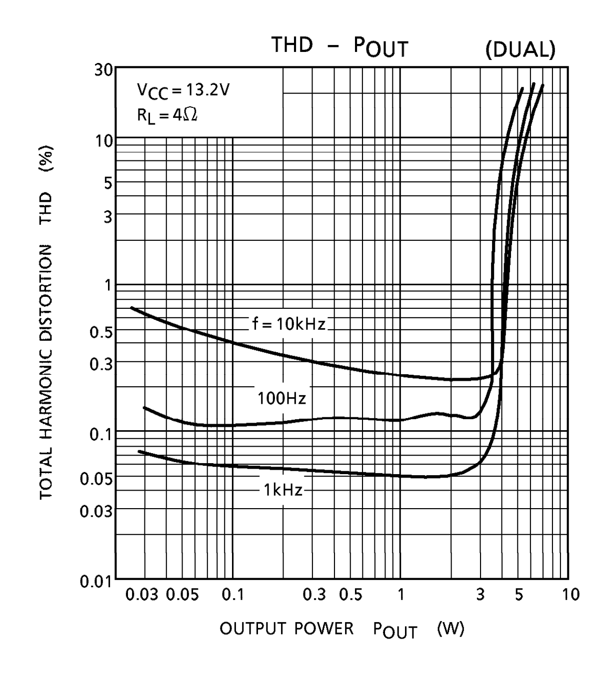
(1) BTL

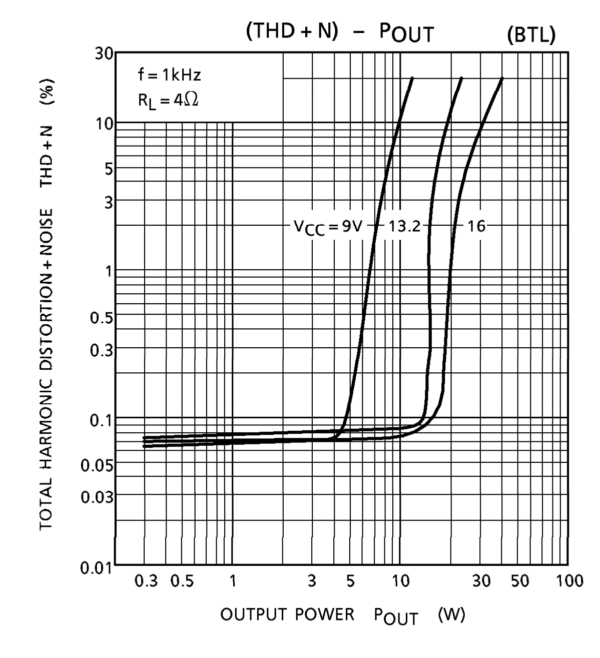


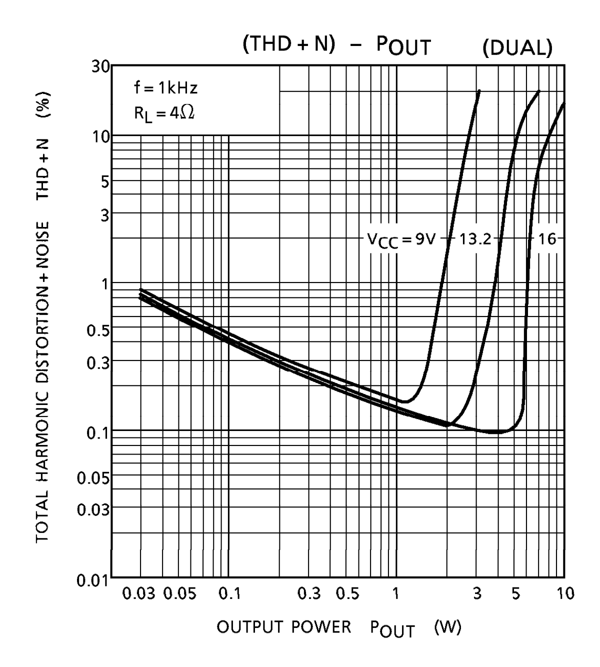
(2) DUAL

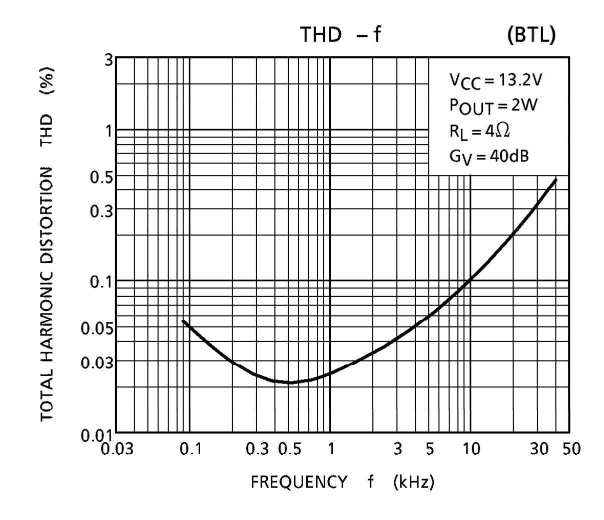


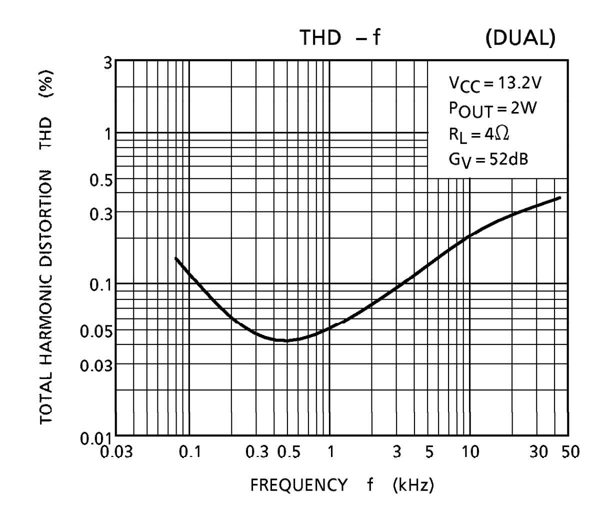

THD – POUT (BTL)
VCC = 13.2V
RL = 4Ω
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER POUT (W)
30
10
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.3 0.5 1 3 5 10 30 50 100

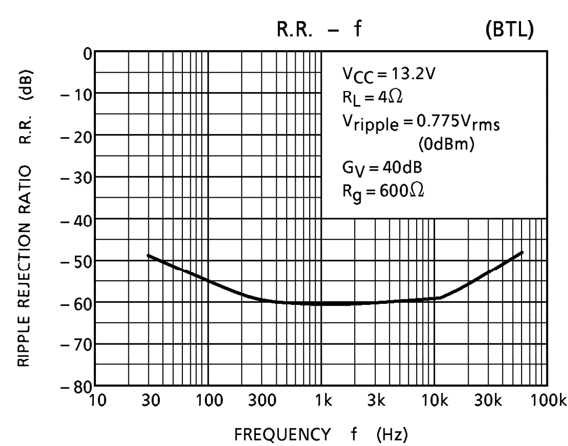

THD – POUT (DUAL)
VCC = 13.2V
RL = 4Ω
f = 10kHz
100Hz
1kHz
TOTAL HARMONIC DISTORTION THD (%)
OUTPUT POWER POUT (W)
30
10
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.03 0.05 0.1 0.3 0.5 1 3 5 10

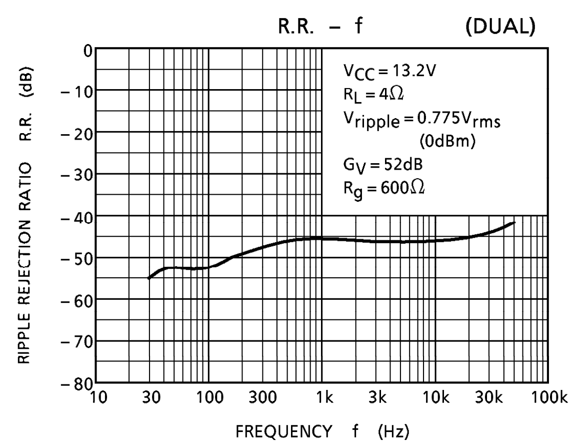

(THD + N) – POUT (BTL)
f = 1kHz
RL = 4Ω
VCC = 9V
13.2
16
TOTAL HARMONIC DISTORTION + NOISE THD + N (%)
OUTPUT POWER POUT (W)
30
10
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.3 0.5 1 3 5 10 30 50 100

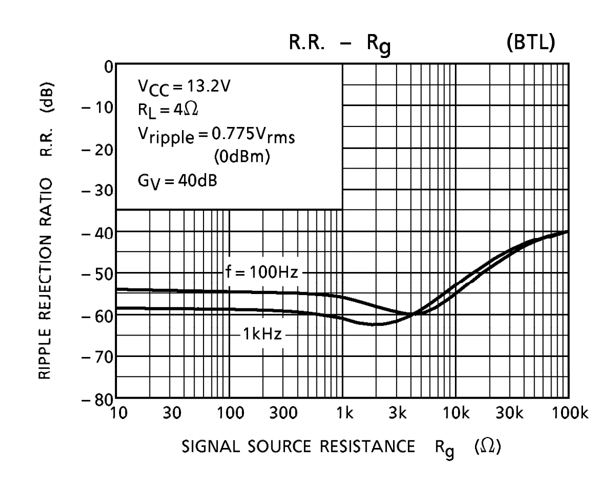

(THD + N) – POUT (DUAL)
f = 1kHz
RL = 4Ω
VCC = 9V
13.2
16
TOTAL HARMONIC DISTORTION + NOISE THD + N (%)
OUTPUT POWER POUT (W)
30
10
5
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.03 0.05 0.1 0.3 0.5 1 3 5 10

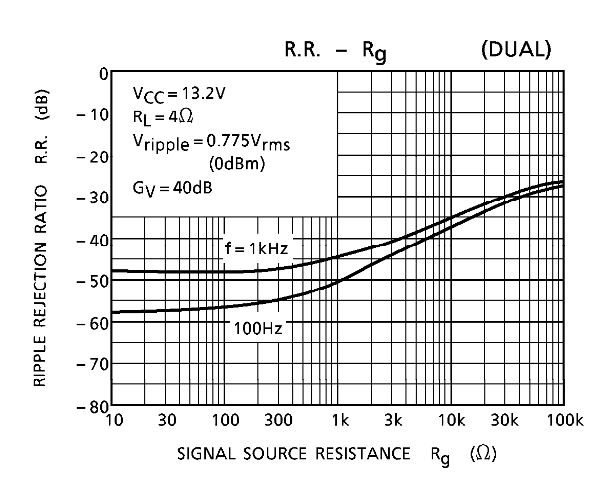

THD – f (BTL)
V_{CC} = 13.2V
P_{OUT} = 2W
R_L = 4Ω
G_V = 40dB
TOTAL HARMONIC DISTORTION THD (%)
FREQUENCY f (kHz)
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.03
0.1
0.3 0.5
1
3
5
10
30
50

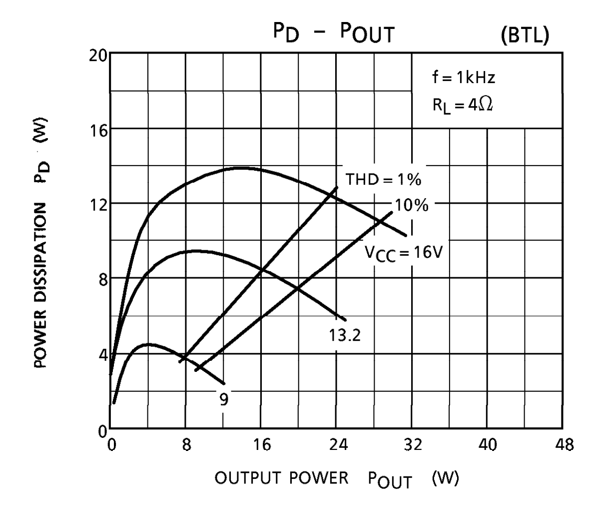

THD – f (DUAL)
V_{CC} = 13.2V
P_{OUT} = 2W
R_L = 4Ω
G_V = 52dB
TOTAL HARMONIC DISTORTION THD (%)
FREQUENCY f (kHz)
3
1
0.5
0.3
0.1
0.05
0.03
0.01
0.03
0.1
0.3 0.5
1
3
5
10
30
50

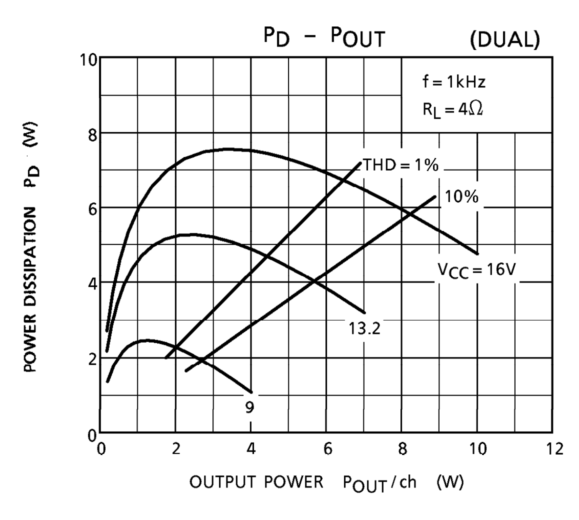

R.R. – f (BTL)
V_{CC} = 13.2V
R_L = 4Ω
V_{ripple} = 0.775V_{rms}
(0dBm)
G_V = 40dB
R_g = 600Ω
RIPPLE REJECTION RATIO R.R. (dB)
FREQUENCY f (Hz)
0
– 10
– 20
– 30
– 40
– 50
– 60
– 70
– 80
10
30
100
300
1k
3k
10k
30k
100k

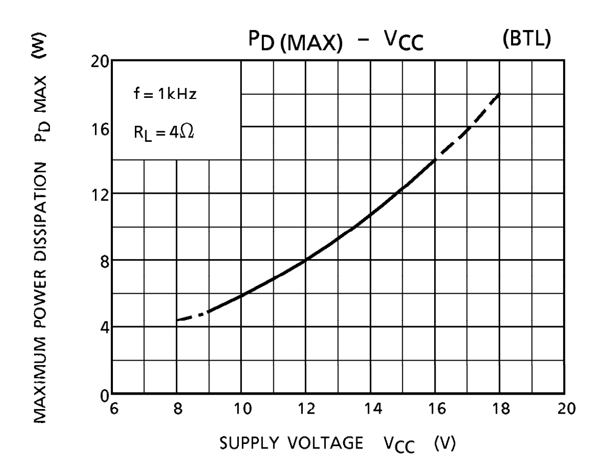

R.R. – f (DUAL)
V_{CC} = 13.2V
R_L = 4Ω
V_{ripple} = 0.775V_{rms}
(0dBm)
G_V = 52dB
R_g = 600Ω
RIPPLE REJECTION RATIO R.R. (dB)
FREQUENCY f (Hz)
0
– 10
– 20
– 30
– 40
– 50
– 60
– 70
– 80
10
30
100
300
1k
3k
10k
30k
100k

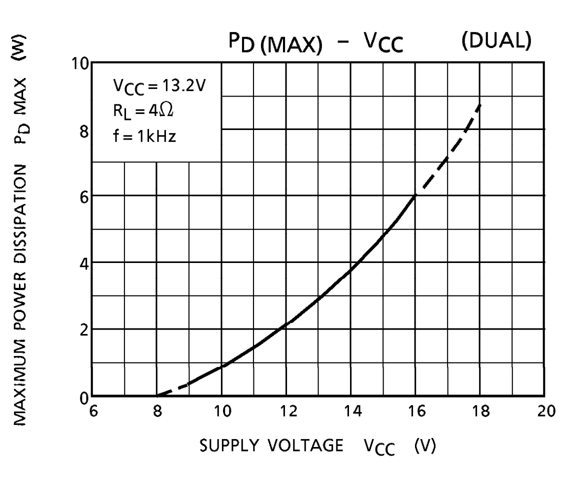

R.R. – R_g (BTL)
V_{CC} = 13.2V
R_L = 4Ω
V_{ripple} = 0.775V_{rms}
(0dBm)
G_V = 40dB
f = 100Hz
1kHz
RIPPLE REJECTION RATIO R.R. (dB)
SIGNAL SOURCE RESISTANCE R_g (Ω)
0
– 10
– 20
– 30
– 40
– 50
– 60
– 70
– 80
10
30
100
300
1k
3k
10k
30k
100k

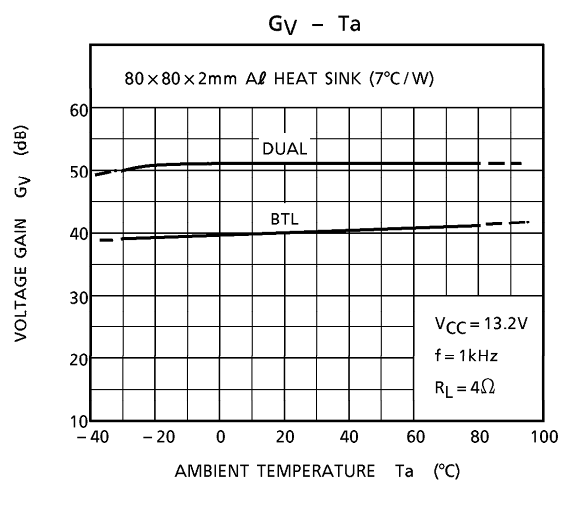

R.R. – R_g (DUAL)
V_{CC} = 13.2V
R_L = 4Ω
V_{ripple} = 0.775V_{rms}
(0dBm)
G_V = 40dB
f = 1kHz
100Hz
RIPPLE REJECTION RATIO R.R. (dB)
SIGNAL SOURCE RESISTANCE R_g (Ω)
0
– 10
– 20
– 30
– 40
– 50
– 60
– 70
– 80
10
30
100
300
1k
3k
10k
30k
100k

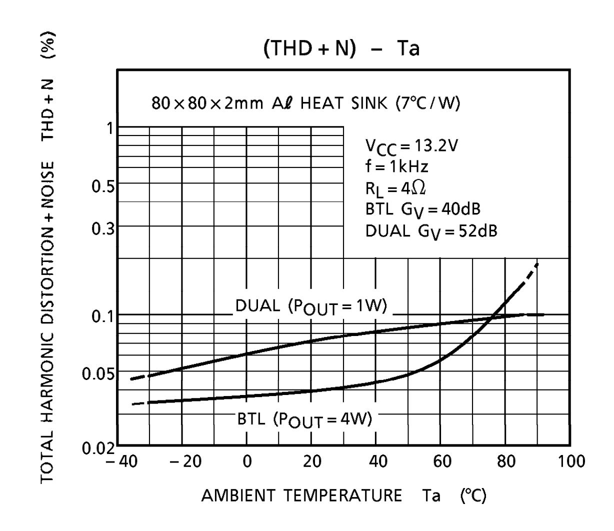

PD – POUT (BTL)
f = 1kHz
RL = 4Ω
THD = 1%
10%
VCC = 16V
13.2
9
POWER DISSIPATION PD (W)
OUTPUT POWER POUT (W)

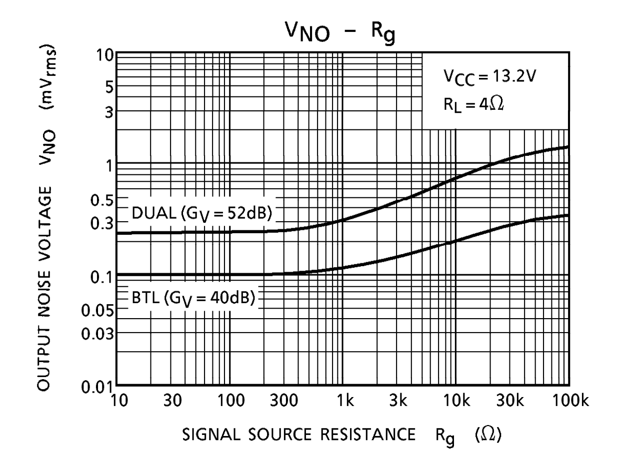

PD – POUT (DUAL)
f = 1kHz
RL = 4Ω
THD = 1%
10%
VCC = 16V
13.2
9
POWER DISSIPATION PD (W)
OUTPUT POWER POUT / ch (W)

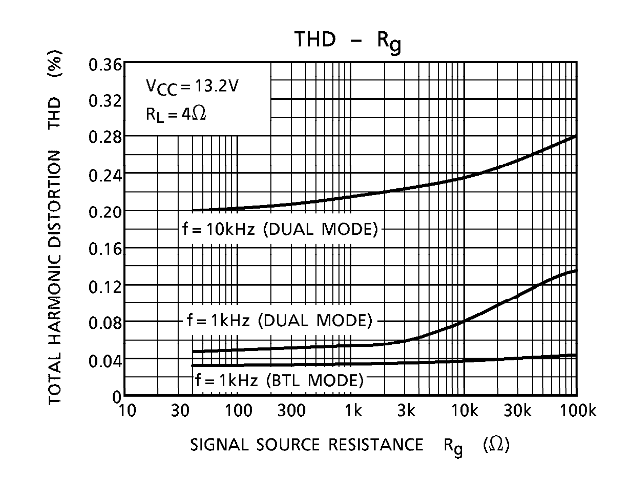

PD (MAX) – VCC (BTL)
f = 1kHz
RL = 4Ω
MAXIMUM POWER DISSIPATION PD MAX (W)
SUPPLY VOLTAGE VCC (V)

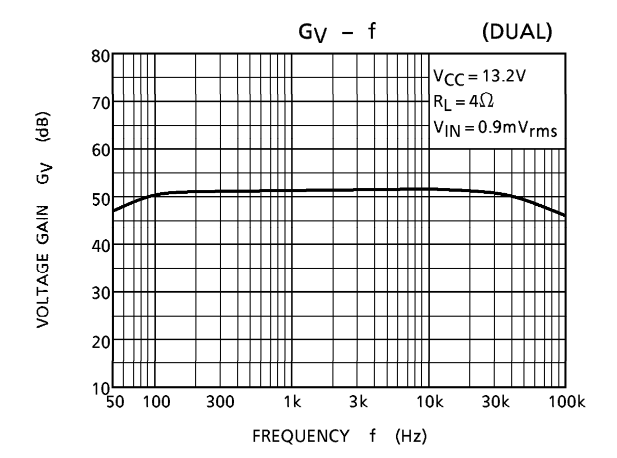

PD (MAX) – VCC (DUAL)
VCC = 13.2V
RL = 4Ω
f = 1kHz
MAXIMUM POWER DISSIPATION PD MAX (W)
SUPPLY VOLTAGE VCC (V)

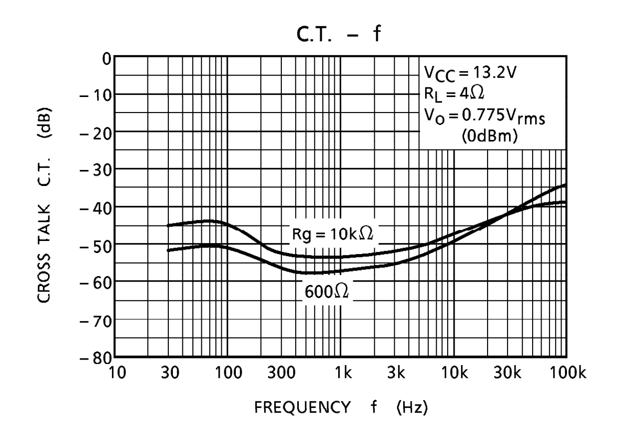

GV – Ta
80 × 80 × 2mm Aℓ HEAT SINK (7°C / W)
DUAL
BTL
VCC = 13.2V
f = 1kHz
RL = 4Ω
VOLTAGE GAIN GV (dB)
AMBIENT TEMPERATURE Ta (°C)

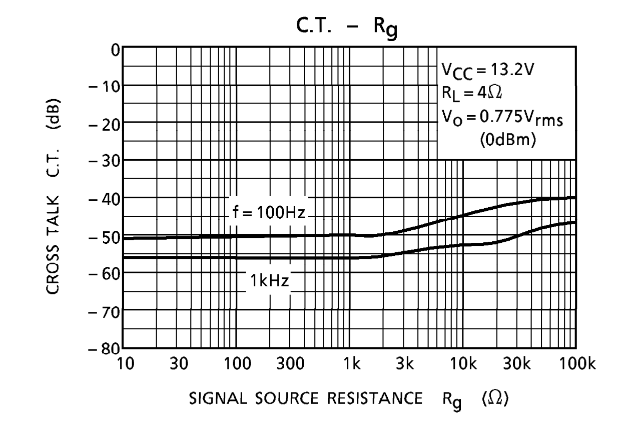

(THD + N) – Ta
80 × 80 × 2mm Aℓ HEAT SINK (7°C / W)
VCC = 13.2V
f = 1kHz
RL = 4Ω
BTL GV = 40dB
DUAL GV = 52dB
DUAL (POUT = 1W)
BTL (POUT = 4W)
TOTAL HARMONIC DISTORTION + NOISE THD + N (%)
AMBIENT TEMPERATURE Ta (°C)

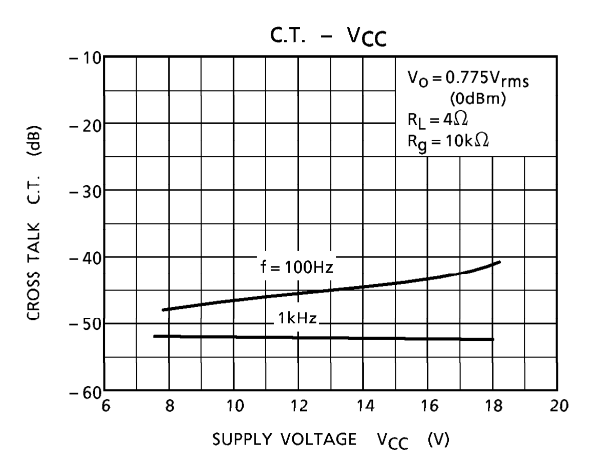

VNO – Rg
VCC = 13.2V
RL = 4Ω
DUAL (GV = 52dB)
BTL (GV = 40dB)
OUTPUT NOISE VOLTAGE VNO (mVrms)
SIGNAL SOURCE RESISTANCE Rg (Ω)

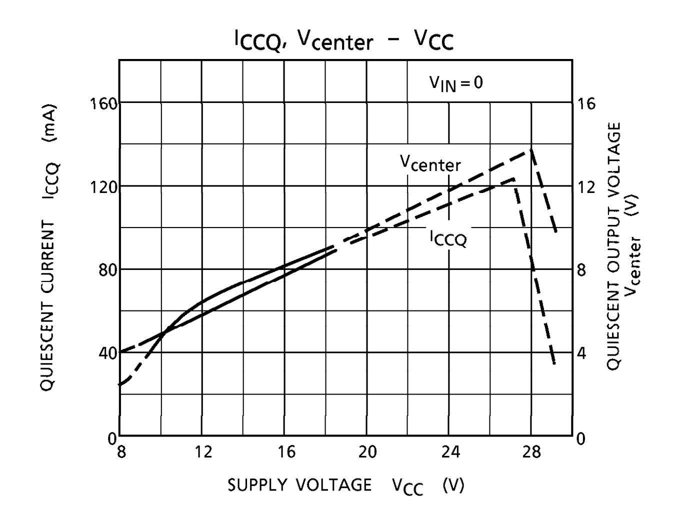

THD – Rg
VCC = 13.2V
RL = 4Ω
f = 10kHz (DUAL MODE)
f = 1kHz (DUAL MODE)
f = 1kHz (BTL MODE)
TOTAL HARMONIC DISTORTION THD (%)
SIGNAL SOURCE RESISTANCE Rg (Ω)

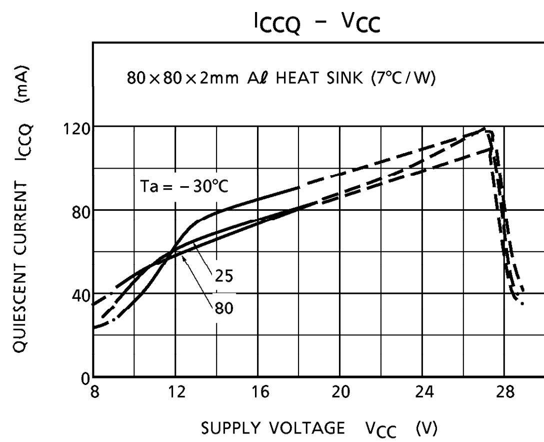

GV – f (DUAL)
VCC = 13.2V
RL = 4Ω
VIN = 0.9mVrms
VOLTAGE GAIN GV (dB)
FREQUENCY f (Hz)

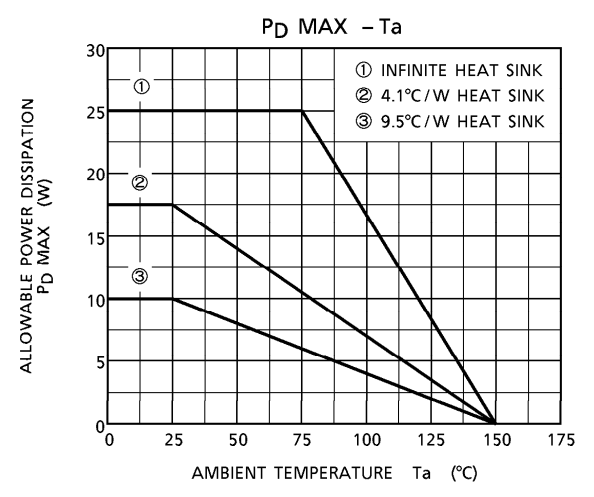

C.T. – f
VCC = 13.2V
RL = 4Ω
VO = 0.775Vrms
(0dBm)
Rg = 10kΩ
600Ω
CROSS TALK C.T. (dB)
FREQUENCY f (Hz)


C.T. – Rg
VCC = 13.2V
RL = 4Ω
VO = 0.775Vrms
(0dBm)
f = 100Hz
1kHz
CROSS TALK C.T. (dB)
SIGNAL SOURCE RESISTANCE Rg (Ω)


C.T. – VCC
VO = 0.775Vrms
(0dBm)
RL = 4Ω
Rg = 10kΩ
f = 100Hz
1kHz
CROSS TALK C.T. (dB)
SUPPLY VOLTAGE VCC (V)


I_{CCQ}, V_{center} – V_{CC}
V_{IN} = 0
V_{center}
I_{CCQ}
QUIESCENT CURRENT I_{CCQ} (mA)
QUIESCENT OUTPUT VOLTAGE V_{center} (V)
SUPPLY VOLTAGE V_{CC} (V)
0 40 80 120 160
0 4 8 12 16
8 12 16 20 24 28

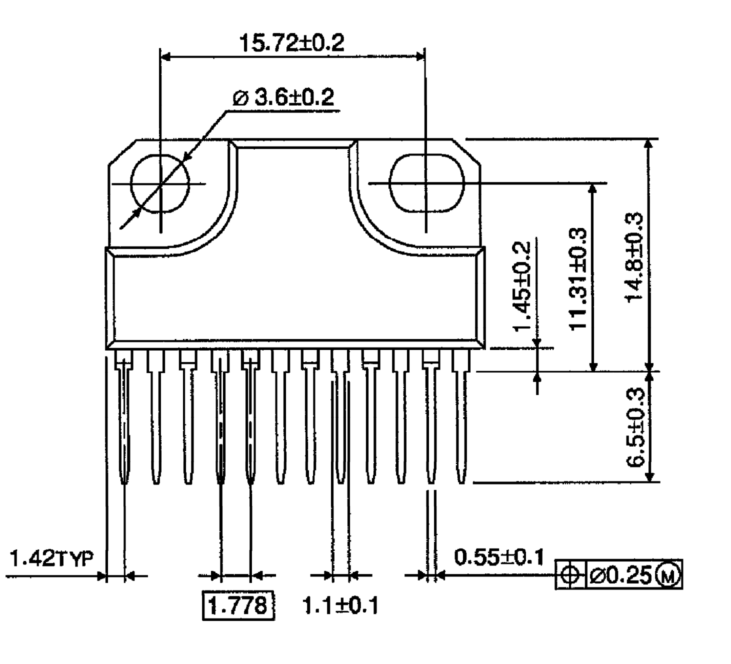

I_{CCQ} – V_{CC}
80 × 80 × 2mm Aℓ HEAT SINK (7°C / W)
Ta = –30°C
25
80
QUIESCENT CURRENT I_{CCQ} (mA)
SUPPLY VOLTAGE V_{CC} (V)
0 40 80 120
8 12 16 20 24 28

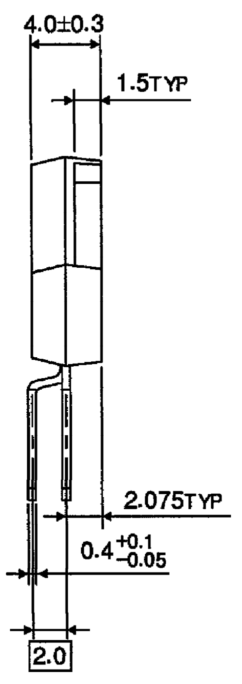

P_D MAX – Ta
① INFINITE HEAT SINK
② 4.1°C / W HEAT SINK
③ 9.5°C / W HEAT SINK
①
②
③
ALLOWABLE POWER DISSIPATION P_D MAX (W)
AMBIENT TEMPERATURE Ta (°C)
0 5 10 15 20 25 30
0 25 50 75 100 125 150 175

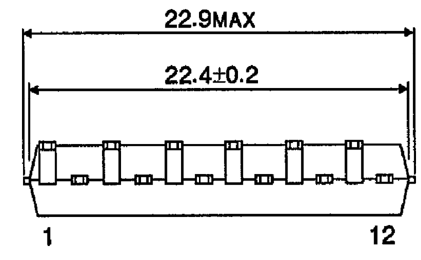
OUTLINE DRAWING

HZIP12-P-1.78B

Unit : mm







Weight : 4.04g (Typ.)